Application Note: TT8500AN008

Skypatrol Evolution GSM/GPRS Mobile Location Unit Trimble ASCII Interface Protocol (TAIP) Reference

Revision 1.01a

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Objective:

The intent of this document is to provide the Trimble ASCII Interface Protocol (TAIP) reference information that allows the user to configure the Trimble TAIP features, if selected, as the reporting format.

Supported devices:

- TT8540 Skypatrol Evolution MLU

  Note: Some features may not be available on some hardware or firmware revisions. Please consult the applicable hardware documentation and firmware release notes.

References:

- TT8540AN001 - Evolution MLU Quick Start Guide
- TT8540PB001MAN - Evolution MLU User Manual
- TT8500PB001MAN - Evolution MLU AT Command Set

Overview:

Trimble ASCII Interface Protocol (TAIP) is a Trimble-specified digital communication interface based on printable ASCII characters over a serial data link. TAIP was designed specifically for vehicle tracking applications but has become common in a number of other applications because of its ease of use. TAIP supports both scheduled and polled responses. TAIP messages may be scheduled for output at a user specified rate starting on a given epoch from top of the hour. For communication robustness, the protocol optionally supports checksums on all messages. It also provides the user with the option of tagging all messages with the unit's user specified identification number (ID). This greatly enhances the functional capability of the unit in a network environment. Additionally, given the printable ASCII format of all communication, TAIP is ideal for use with mobile data terminals, seven bit modems and portable computers. Although, sensors incorporating this protocol are shipped from the factory with a specific serial port setting, the port characteristics are fully programmable through TAIP messages. This document is designed for easy reference to TAIP message formats and describes all the TAIP messages defined at the time of printing. The Skypatrol Evolution MLU supports the following TAIP messages:

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TABLE 1. SKYPATROL EVOLUTION MLU GPS SUPPORTED TAIP MESSAGES INCLUDE:

AL Altitude/Up Velocity	PR Protocol
AP Auxiliary Port Characteristics	PT Port Characteristic
CP Compact Position Solution	PV Position/Velocity Solution
DC Differential Corrections	RM Reporting Mode
DD Delta Differential Corrections	RT Reset Mode
ID Identification Number	ST Status
IP Initial Position	TM Time/Date
LN Long Navigation Message	VR Version Number

Skypatrol Evolution MLU uses the following commands to communicate TAIP messages with the Trimble GPS receiver:

To enable TAIP messages to be sent from the GPS receiver to the local serial port, send the following AT command: AT$GPSLCL=3

To send TAIP commands from the serial port to the GPS receiver use the following command: AT$TAIP= >"TAIP_command< "

There are certain cases where the PV data may not automatically report every 5 seconds. To enable this reporting, send the following command: AT$TAIP=">FPV0005<"

Message Format

All TAIP communication uses printable, uppercase ASCII characters. The interface provides the means to configure the unit to output various sentences in response to queries or on a scheduled basis. Each sentence has the following general format:

>ABB{C}[;ID=DDDD][;*FF]<

where:

TABLE 2. MESSAGE FORMATS

>	Start of new message
A	Message qualifier
BB	A two character message identifier
C	Data string
DDDD	Optional 4 character vehicle ID
FF	Optional 2 character checksum
<	Delimiting character
{*x*}	Signifies that *x* can occur any number of times
[*x*]	Signifies that *x* may optionally occur once

Start of a New Message

The > character (ASCII code 62 decimal) is used to specify the start of a new sentence.

Message Qualifier

A one-character message qualifier is used to describe the action to be taken on the message. The following table lists the valid qualifiers.

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TABLE 3 MESSAGE FORMAT QUALIFIERS

Qualifier	Action
Q	Query for a single sentence (sent to GPS sensor)
R	Response to a query or a scheduled report (from the sensor)
F	Schedule reporting frequency interval in seconds
S	Enables equipment to be initialized, and sets various message types
D	Specify a minimum distance traveled and a minimum and maximum time interval for the next report

Details on the use of message qualifiers are given in section entitled:
Communication Using TAIP.

Note All TAIP message characters must be in upper case

Message Identifier
A unique two-character message identifier consisting of alphabetical characters is used to identify type messages. For example: PR for Protocol or VR for Version Number.

Data String
The format and length of a data string is dictated by the message qualifier and the message identifier. The data string may contain any printable ASCII character with the exception of the >, <, and ; characters. Detailed descriptions of each message format are provided in the specific message sections of this Appendix. Most messages are length sensitive and unless otherwise specified, field separators, including spaces are not used.

Vehicle ID
A vehicle identification (ID) may optionally be used in all the communications with the sensor. Each sensor in the fleet may be assigned a four character alpha-numeric ID and be forced to output that ID in all messages. The default is: ID set to **0000** and the ID Flag set to **F (false).**

The sensor will check all incoming messages for ID. If no ID is specified, the sensor will accept the message. If the ID is included in messages but does not compare with the ID previously set, the message will be ignored. This applies even when the ID Flag is turned off.

Checksum
The checksum field provides for an optional two digit hex checksum value, which is computed as XOR of *all characters* from the beginning of the sentence up to and including the * character. If provided, the checksum is always the last element of the sentence before the message delimiter. The default mode of operation is to include checksum in sentences. The use of checksums can help in instances where the communication channel is noisy.

Example:

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The following message to set the vehicle ID flag on includes checksum.

>SRM;ID_FLAG=T;*6F<

The checksum (6F) was generated by XOR'ing the ASCII codes for > and S then XOR'ing that result with the ASCII code for R and so forth, up to and including the * character.

Message Delimiter
The < character signifies end of a sentence and is used as the message delimiter.

Sample PV Message

The Position/Velocity Solution (PV) message is one of the more commonly used TAIP messages and most sensors using TAIP are set by default to output the PV message once every 5 seconds.

The following analysis of a typical PV message is provided to further explain the TAIP message protocol.

>RPV15714+3739438-1220384601512612;ID=1234;*7F<

TABLE 4. SAMPLE PV MESSAGE FIELDS

ID	Meaning
>	Start of Message Delimiter
R	Response Qualifier
PV	PV message Identifier
15714	GPS Time of Day
+3739438	Latitude
-12203846	Longitude
015	Speed
126	Heading
1	Source of Data
2	Age of Data
;ID=1234	Vehicle ID
;*7F	Checksum
<	End of Message Delimiter

Note Refer to the discussion of the PV message data string for more details on how this message is interpreted

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Time and Distance Reporting

The "D" message qualifier allows you to specify a minimum distance traveled as well as a minimum and maximum time interval for the next report. Units that are stationed at a fixed location can be programmed to report only when the unit moves "off station" or after a certain elapsed time since last report, but no more often than the specified minimum time interval.

The message format used with the "D" qualifier is shown below:
>DAABBBBCCCCEEEEFFFF[;ID=GGGG][;*HH]<

TABLE 5. TIME AND DISTANCE REPORTING MESSAGE FORMAT QUALIFIERS

ID	Meaning
>	start of message delimiter
D	the Distance message qualifier
AA	message to report (i.e. PV means Position Velocity message)
BBBB	minimum time (seconds) interval between reports (T interval)
CCCC	report epoch (number of seconds from top of the hour)
EEEE	delta distance (meters) from last reported distance
FFFF	maximum time (seconds) interval between reports (T max)
GGGG	optional vehicle identification number (user selected)
HH	optional checksum
<	End of message delimiter

Note If BBBB = 0, then the message output is disabled. If FFFF = 0, maximum time feature is disabled (the unit will only report if current position is greater than or equal to the delta distance specified in EEEE).

Example:

When the message: >DPV0030000505000900;ID=0105< is sent to the GPS receiver, it specifies that vehicle number 105 *(GGGG* = 0105) is to report the Position Velocity message *(AA* = PV) whenever its current position differs from the previously reported position by at least 500 meters *(EEEE* = 0500), but no more often than every 30 seconds *(BBBB* = 0030) or less often than every 15 minutes *(FFFF* = 0900 seconds). The minimum and maximum time-out reports are to be issued with a 5 second offset *(CCCC* = 0005) from the top of the hour. The optional checksum was not used in this example. The square brackets, [...], shown in the format description above are used to indicate optional data.

Note: The brackets themselves are never included in the actual TAIP message string.

The "D" message qualifier was designed by Trimble for use by Ambulance Companies to limit communication traffic between mobile units and the base when the ambulances are stationary on-station. When the ambulance has reached its stationary dispatch site, the operator signals the base by voice or by pushing a button on a Mobile Data Terminal (MDT) signifying that the unit is now on station. Once this

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communication is made, the base operator issues a 'D' qualifier and message so that the ambulance will only report either when it moves off-station or at specific reporting intervals.

Latitude and Longitude Conversion

The TAIP protocol reports latitude as positive north decimal degrees and longitude as positive east decimal degrees, using the WGS-84 datum. For your application, you may wish to convert to degrees, minutes and seconds. The following example illustrates the conversion of decimal degrees to degrees, minutes and seconds.

Example:

Given latitude and longitude in decimal degrees,

Latitude:	+37.39438 degrees
Longitude:	-122.03846 degrees

Convert latitude by multiplying the decimal fraction of degrees by 60 to convert to minutes

0.39438 x 60 = 23.6628 minutes

Retain the integer (23) portion as the minutes then multiply the decimal fraction by 60 to convert to seconds,

0.6628 x 60 = 39.768 seconds

Since the sign of the latitude in this example is positive the result is:

Latitude: N 37 o 23' 39.77"

The longitude is converted in the same fashion:

Longitude: W 122 o 02' 18.46"

Note At the earth's equator, one degree of latitude and longitude represents 68.7 miles; therefore, 0.00001 degrees represents approximately 3.6 feet or 1.1 meters. Each second represents approximately 100.76 ft. (30.7 m).

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Message Data Strings

The following table lists all the TAIP messages currently defined and comments regarding their application:

TABLE 6. MESSAGE DATA STRING DESCRIPTIONS

Identifier	Message Name	Frequency and Distance	Query	Response/ Report	Set
AL	Altitude/Vertical Velocity	X	X	X	X
AP	Auxiliary Port Characteristic		X	X	
CP	Compact Position Solution	X	X	X	X
DC	Differential Corrections				X
DD	Delta Differential Corrections				X
ID	Vehicle ID	X	X	X	X
IP	Initial Position	X	X	X	X
LN	Long Navigation Message	X	X	X	
PR	Protocol		X	X	
PT	Port Characteristic		X	X	
PV	Position/Velocity Solution	X	X	X	X
RM	Reporting Mode	X	X	X	X
RT	Reset				X
ST	Status	X	X	X	
TM	Time/Date	X	X	X	
VR	Version Number	X	X	X	X

The data string format of each message is described in the following pages.

Note All TAIP message characters must be in uppercase

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AL Altitude/Up Velocity

Note The first character of altitude or vertical velocity is "+" or "-".

Data String Format:

AAAAABBBBBBCCCCDE

TABLE 7. ALTITUDE/UP VELOCITY DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
GPS Time of day	5	Sec	AAAAA	
Altitude	6	Meter	BBBBBB	
Vertical Velocity	4	MPH	CCCC	
Source	1	N/A	D	0 = 2D GPS 1 = 3D GPS 2 = 2D DGPS 3 = 3D DGPS 6 = DR 8 = Degraded DR 9 = Unknown
Age of Data Indicator	1	N/A	E	2 = Fresh, <10 seconds 1 = Old, >10 seconds 0 = Not available
Total # of characters is 17				

Altitude is above mean sea level in WGS-84. The GPS time of day is the time of fix rounded to the nearest second. This message contains data obtained from the last 3 dimensional fix and may not be current.

Note The data in this message is to be considered invalid and should not be used, if the Age of Data Indicator is equal to 0 (signifying data not available).

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CP Compact Position Solution

Note The first character of latitude or longitude is "+" or "-"."

Data String Format:

AAAAABBBCCCCDDDDEEEEFG

TABLE 8. COMPACT POSITION SOLUTION DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
GPS Time of day	5	Sec	AAAAA	
Latitude	7	Deg	BBBCCCC	
Longitude	8	Deg	DDDDEEEE	
Source	1	N/A	F	0 = 2D GPS 1 = 3D GPS 2 = 2D DGPS 3 = 3D DGPS 6 = DR 8 = Degraded DR 9 = Unknown
Age of Data Indicator	1	N/A	G	2 = Fresh, <10 seconds 1 = Old, >10 seconds 0 = Not available
Total # of characters is 22				

Position is in latitude (positive north) and longitude (positive east) WGS-84. The GPS time of day is the time of fix rounded to the nearest second.

Note The data in this message is to be considered invalid and should not be used, if the Age of Data Indicator is equal to 0 (signifying data not available).

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DC Differential Corrections

The DC message provides the sensor with differential corrections from type-1 and type-9 RTCM-104 records. The numerical values are written out in hex format producing a two character hexadecimal number for each data byte.

Data String Format:

AAAABBCC{DDEEEEFFGG}

TABLE 9. DC DELTA DIFFERENTIAL CORRECTIONS DATA STRING DESCRIPTIONS

Item	# of Char	Type	Units	Format
Modified Z-count	4	Word	.6 sec	AAAA
Station health	2	Byte	N/A	BB
Number of SVs	2	Byte	N/A	CC
The next five bytes (10 characters) are repeated for each SV.				
SV PRN & scale factor	2	Byte	N/A	DD
Range correction	4	Word	RTCM-104	EEEE
Range-rate correction	2	Byte	RTCM-104	FF
IODE	2	Byte	N/A	GG

Units and scale factors are defined by RTCM-104, version 2. The SV PRN and scale factor contains the SV PRN in the lower 5 bits and the scale factor in the higher 3 bits. The scale factor has only three acceptable values:

0 - Use with low scale factor
4 - Use with high scale factor
7 - Do not use

Range corrections are scaled by 0.02 meters for low scale factor and 0.32 m/sec for high scale factor.

Note DC and DD TAIP messages are used to enclose differential corrections within the TAIP format.

Note DC and DD messages used to input corrections require only one communications channel. When the auxiliary port is used to input RTCM 104 corrections, it assumes a separate communications channel is available for broadcast and receipt of differential corrections.

Note The TAIP Software Toolkit does not support DC and DD messages.

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DD Delta Differential Corrections

This message provides the sensor with delta differential corrections from RTCM-104 record type 2. The values are numerical values written out in hex format, thus for each byte of data there is a two digit hex number.

The format of the data string is as follows:

AAAABB{CCDDDD}

TABLE 10. DD DELTA DIFFERENTIAL CORRECTIONS DATA STRING DESCRIPTIONS

Item	# of Char	Type	Units	Format
Modified Z-count	4	Word	.6 sec	AAAA
Number of SVs	2	Byte	N/A	BB
The next three bytes (6 characters) are repeated for each SV.				
SV PRN	2	Byte	N/A	CC
Delta Range correction	4	Word	RTCM-104	DDDD

Note The units and scale factors are as defined by RTCM-104 version 1. The health/UDRE/scale factor given for the specific SV in the most recent message DC is used. Delta range corrections are scaled by 0.02 meters times 2 raised to the health power.

The DC and DD TAIP messages described herein apply only to differential ready sensors and are provided to enclose differential corrections within the TAIP format.

Use of DC and DD messages to input corrections requires only one communications channel. Use of the auxiliary port to input RTCM-104 corrections assumes a separate communications channel is available for broadcast and receipt of differential corrections.

Note The TAIP software toolkit, GPSSK, does not support DC and DD messages.

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ID Identification Number

Data String Format:

AAAA

TABLE 11. IDENTIFICATION NUMBER DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format
Vehicle ID	4	N/A	AAAA
Total number of characters is 4			

This message is used to report or set the vehicle's (or sensor's) unique, four character, alpha-numeric, user assigned ID. The default at cold start is 0000.

Example:

The following message will set the vehicle ID to 101.

>SID0101<

The following is simply a response to a query for vehicle ID.

>RID0101<

Note The sensor will always check incoming messages for ID and compare with the vehicle ID set in the sensor's memory. If no ID is included in the message, the sensor will assume a match and accept the message. If the message sent to the sensor does contain a vehicle ID but that ID does not match the ID previously set in the sensor, the message will be ignored. This process is followed even when the ID_Flag is turned off (refer to the message RM).

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IP Initial Position

Data String Format:

AAABBBBCCCCC

TABLE 12. INITIAL POSITION DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format
Initial Latitude	3	Deg	AAA
Initial Longitude	4	Deg	BBBB
Initial Altitude	5	10 Meters	CCCCC
Total # of characters is 12			

This is a very coarse initial position that the user can provide to aid the sensor in obtaining its first fix. This is particularly useful with sensors that do not have non-volatile (Battery Backed-up) memory. In such cases, every time the unit is powered up, it goes through a complete cold-start and it has absolutely no knowledge of where it is. Providing this message improves performance by decreasing the time to first fix and enhances the accuracy of the initial two dimensional navigation solutions by providing a reference altitude. In case of units with non-volatile memory, sending this message is only helpful if the unit has moved more than 1,000 miles since its previous fix. In either case, the sensor can initialize itself appropriately without any data from the user; it merely requires more time.

Note For all the above values, the first character specifies the sign (+/-).

Example:

The following message will set the initial position to 37° North, 122° West, altitude 10 meters.

>SIP+37-122+0001<

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LN Long Navigation Message

Note The first character of latitude, longitude, altitude or vertical speed is "+" or "-".

Data String Format:

AAAAA.BBBCCCDDDDDDDEEEEFFFFFFFGGGGGGHHIIIJKKKKLM
MMNOOPPQQPPQQ...PPQQRRRRRRRRRRST

TABLE 13. LONG NAVIGATION MESSAGE DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
GPS Time of day	8	Sec	AAAAA.BBB	
Latitude	10	Deg	CCC.DDDDDDD	
Longitude	11	Deg	EEEE.FFFFFFF	
Altitude above MSL	9	Ft	GGGGGGG.HH	
Horizontal Speed	4	MPH	III.J	
Vertical Speed	5	MPH	KKKK.L	
Heading	4	Deg	MMM.N	
Number of SVs used	2	N/A	OO	
SV Id (see note)	2	N/A	PP	
IODE (see note)	2	N/A	QQ	
Reserved	10	N/A	RRRRRRRRRR	
Source	1	N/A	S	0 = 2D GPS 1 = 3D GPS 2 = 2D DGPS 3 = 3D DGPS 6 = DR 8 = Degraded DR 9 = Unknown
Age of Data Indicator	1	N/A	T	2 = Fresh, <10 seconds 1 = Old, >10 seconds 0 = Not available
Total # of characters is 65+4x(number of SV's used)				

Note At least 2 satellites are required to get the LN Message.

Position is in Degrees, minutes, decimal minutes. And latitude is (positive north) and longitude (positive east) WGS-84. Heading is in degrees from True North increasing eastwardly. The GPS time of day is the time of fix rounded to the nearest second

Note The data in this message is to be considered invalid and should not be used, if the Age of Data Indicator is equal to 0 (signifying data not available).

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PV Position/Velocity Solution

Note The first character of latitude or longitude is "+" or "-".

Data String Format:

AAAAABBBCCCCCDDDDEEEEEFFFGGGHI

TABLE 14. POSITION/VELOCITY SOLUTION DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
GPS Time of day	5	Sec	AAAAA	
Latitude	8	Deg	BBB.CCCCC	
Longitude	9	Deg	DDDD.EEEEE	
Speed	3	MPH	FFF	
Heading	3	Deg	GGG	
Source	1	N/A	H	0 = 2D GPS 1 = 3D GPS 2 = 2D DGPS 3 = 3D DGPS 6 = DR 8 = Degraded DR 9 = Unknown
Age of Data Indicator	1	N/A	I	2 = Fresh, <10 seconds 1 = Old, >10 seconds 0 = Not available
Total # of characters is 30				

Position is in latitude (positive north) and longitude (positive east) WGS-84. Heading is in degrees from True North increasing eastwardly. The GPS time of day is the time of fix rounded to the nearest second.

Note The data in this message is to be considered invalid and should not be used, if the Age of Data Indicator is equal to 0 (signifying data not available).

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RM Reporting Mode

Data String Format:

[;ID_FLAG= A][;CS_FLAG= B][;EC_FLAG= C] [;FR_FLAG= D] [;CR_FLAG=E]

TABLE 15. REPORTING MODE DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
ID Flag	1	N/A	A	T = True F = False
CS Flag	1	N/A	B	T = True F = False
EC Flag	1	N/A	C	T = True F = False
FR Flag	1	N/A	D	T = True F = False
CR Flag	1	N/A	E	T = True F = False

ID Flag determines whether the unit is to include the vehicles ID with each report.

CS Flag determines whether the unit is to include a checksum as part of each message.

EC Flag, when set, will cause the unit to echo back all complete and properly formatted set commands, except for DC and DD, with a "Response qualifier ." This provides an easy way to verify that the unit did in fact receive the intended data.

FR Flag indicates whether the unit is to report messages automatically per their individually scheduled frequency. When set to false, the unit will only respond when queried for a specific message.

CR Flag, when set to True, will cause the sensor to append a carriage return and line feed [CR] [LF] to the end of each message output. This is useful when viewing the un-encoded sensor responses on a terminal or a PC.

The default value at start-up for ID flag and the CR flag is false; the default for CS, EC and FR flags is true.

Example:

The following command will turn checksums off and carriage return on:

>SRM;CS_FLAG=F;CR_FLAG=T<

Note Note the use of semicolon before the flag name.

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RT Reset Mode

Data String Format:

Any one of the following data strings can be set. Upper case characters are required.

[]
[COLD]
[FACTORY]
[SAVE_CONFIG]

TABLE 16. RESET MODE DATA STRING DESCRIPTIONS

Message	Description
>SRT<	Warm Start
>SRTCOLD<	Cold Start
>SRTFACTORY<	Factory reset
>SRTSAVE_CONFIG<	Save serial EEPROM user values

The SAVE_CONFIG data string will save parameters entered to SEEPROM.

To save parameters to a TAIP-speaking receiver, follow these steps:

1. Change the protocol to TSIP using the TAIP PR command.
2. Enter the parameters via TSIP commands (see section 3.7).
3. Change the protocol to TAIP using TSIP command 0xBC.
4. Save to SEEPROM using the TAIP command >SRTSAVE_CONFIG<.

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ST Status

Data String Format:

AABCDDEFGG

Note This message provides information about the satellite tracking status and the operational health of the sensor. This information is contained in five status bytes which are output as five 2 digit hexadecimal values. The data format and the meanings of the hex characters are given in the following tables.

TABLE 17. DATA STRING HEX CHARACTERS

Item	# of Char	Units	Format	Definition
Tracking Status Code	2	N/A	AA	(see table below)
Status Codes Nibble 1	1	N/A	B	(see table below)
Status Codes Nibble 2	1	N/A	C	(see table below)
Machine ID	2	N/A	DD	
Status Codes Nibble 3	1	N/A	E	(not currently used)
Status Codes Nibble 4	1	N/A	F	(see table below)
Reserved	2	N/A	GG	(not currently used)

TABLE 18. TRACKING STATUS CODE

Value	AA Meaning
00	Doing position fixes
01	Don t have GPS time yet
02	Not used
03	PDOP is too high
08	No usable satellites
09	Only 1 usable satellite
0A	Only 2 usable satellite
0B	Only 3 usable satellites
0C	Chosen satellite is unusable

TABLE 19. ERROR CODES: NIBBLE 1

Value of B	Meaning
0	No problems reported
1	Antenna feedline fault

TABLE 20. ERROR CODES: NIBBLE 2

Value of C	Meaning
0	No problems reported
1	Battery-backup failed; RAM not available at power-up (see note)

TABLE 21. ERROR CODES: NIBBLE 4

Value of F	Meaning
0	No problems reported
2	RTC not available at power-up (see Note)
8	Stored almanac not complete and current
A	RTC not available; stored almanac not complete and current

Note After the status is detected, this bit remains set until the sensor is reset

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TM Time/Date

Data String Format:

AABBCCDDDEEFFGGGGHHIJJKLLLLL

TABLE 22. TM TIME/DATA DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format	Value
Hour	2	Hour	AA	
Minutes	2	Min	BB	
Seconds	5	Sec	CC.DDD	
Date; Day	2	Day	EE	
Date; Month	2	Month	FF	
Date; Year	4	Year	GGGG	
GPS UTC Time Offset	2	Sec	HH	
Current fix Source	1	N/A	I	0 = 2D GPS 1 = 3D GPS 2 = 2D DGPS 3 = 3D DGPS 6 = DR 8 = Degraded DR 9 = Unknown
Number of Usable SVs	2	N/A	JJ	
GPS UTC Offset Flag	1	N/A	K	0 = Invalid 1 = Valid
Reserved	5	N/A	LLLLL	
Total # of characters is 28				

This message outputs the time and date as computed by the GPS sensor. The time is most accurate when the unit is doing fixes. It is less accurate but still usable when the unit is not doing fixes but the Number of Usable SVs is one or more. If the GPS UTC offset is available, the time will be in UTC. If not, the time will be in GPS.

Note GPS UTC Time Offset is the difference between GPS and UTC time standards in seconds. The UTC time of Day is only valid if the GPS UTC Offset Valid Flag is indicating valid.

Note The TM message is not supported under the Set qualifier.

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VR Version Number

Data String Format:

XXXXXXX;VERSION A.AA (BB/BB/BB);

TABLE 23. VERSION NUMBER DATA STRING DESCRIPTIONS

Item	# of Char	Units	Format
Product Name	N/A	N/A	N/A
Major Version Number	4	N/A	A.AA
Major Release Date	8	N/A	BB/BB/BB

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Communication Using TAIP

Communication with the unit takes place in four different ways. Message qualifiers are used to differentiate between these.

Query for Single Sentence
The query (Q) message qualifier is used to query the GPS sensor to respond immediately with a specific message. The format is:

>QAA[;ID=BBBB][;*CC]<

where AA is the requested message identifier. Messages supported by this qualifier are AL, AP, CP, ID, IP, LN, PT, PV, RM, ST, TM, and VR.

Scheduled Reporting Frequency Interval
The scheduled reporting frequency interval(F) message qualifier is used to tell the unit how often and when to report a specific message. The format is:

>FAABBBBCCCC[;ID=DDDD][;*FF]<

where sending this sentence tells the unit to report message specified by the two digit identifier AA at the time interval of BBBB seconds with time epoch at CCCC seconds from top of the hour. Specifying time interval of 0000 stops scheduled reporting of the message. The default is 0000 time interval for all messages except PV. The output frequency for PV at cold-start is set at once every five seconds, zero seconds from top of the hour. Messages supported by this qualifier are AL, AP, CP, ID, IP, LN, PT, PV, RM, ST, TM, and VR.

Note The data specified by this qualifier is the timing of the message output and may be different from the time tag of the data in the message.

The Response to Query or Scheduled Report
The response (R) qualifier carries various types of data between the unit and the user equipment. The format is:

>RAA[{B}][;ID=CCCC][;*DD]<

where AA is the two character message identifier and {B} specifies the data string within the message. For the format of {B}, please refer to the message definitions in the previous section. Messages supported by the response qualifier are AL, AP, CP, ID, IP, LN, PT, PV, RM, ST, TM, and VR.

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The Set Qualifier
The set (S) qualifier enables the user equipment to initialize/set-up various types of data in the GPS unit. The format is:

>SAA[{B}][;ID=CCCC][;*DD]<

where AA is the two character message identifier and {B} specifies the data string within the message. For the format of {B}, please refer to the message definitions in the previous section. Note that all the messages have very specific formats and are length dependent. Messages normally supported by the set qualifier are AL, AP, CP, DC, DD, ID, IP, LN, PT, PV, and RM.

The set qualifier may be used with the AL, CP, LN, or PV message to set more precise initial position data into the GPS sensor than can be set with the IP message.

Sample Communication Session
The following is a sample communication session to illustrate how message qualifiers are used. Query the sensor for version number for the TAIP firmware:

>QVR<

The sensor responds with a message in the following form:

>RVR Lassen SQ; VERSION 1.04 (01/23/03);*35<

Note The sensor identified its product name, firmware version number, core signal processing version number, and release dates, then included the checksum for the message (the default for the CS Flag is TRUE). Also notice that the sensor did respond to our query even though we did not send a checksum.

Query the sensor for its ID number:

>QID<

The sensor will respond (assuming factory default settings):

>RID0000;*70<

Set the ID to match the number for a vehicle in your fleet and then tell the sensor to include the Vehicle ID in its responses:

>SID1234<
>SRM;ID_FLAG=T<

The Lassen SQ GPS sensor is set by default to report the PV message once every 5 seconds. To schedule the PV message from vehicle 1234 to respond once every 10 seconds, starting at 5 seconds after the top of the hour, use the following command:

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>FPV00100005;ID=1234<

The sensor will check the ID included in the message for a match with its own and then reschedule the PV message. At the next scheduled time, the sensor will respond with:

>RPV15714+3739438-1220384601512612;ID=1234;*7F<

Note The time given in the message is the time of the last GPS fix (04:21:54 GPS), not necessarily the time of the message response. If the time of last fix is 10 or more seconds old, the age flag will be set to 1.

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End of Document

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